EYE ON THE SKY

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National Weather Service
Louisville, Kentucky

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A Newsletter for Emergency Managers, Core Storm Spotters, Media, and Public Officials in Central Kentucky and South-Central Indiana

Comments and suggestions are always welcome. Your feedback is very important to us!

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This publication also is available on-line at **www.crh.noaa.gov/lmk/newsletter**

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Ted Funk

Tornadoes: FAQs About the Power of Nature

By Ted Funk, Science and Operations Officer

What are tornadoes and where do they come from?
In an average year, about 1,000 tornadoes are reported across the United States, resulting in 80 deaths and over 1,500 injuries. A tornado is a violently rotating column of air extending from a cumuliform cloud and in contact with the ground. A tornado usually (but not always) is visible due to condensation and dust and debris within the rotating column. Strong and violent tornadoes are most likely to occur with supercell thunderstorms, but tornadoes also can occur within bowing lines of storms (i.e., bow echoes). Tornadoes originate from the energy released in a thunderstorm, however they account for only a small fraction of the total energy within a storm. What makes tornadoes dangerous is that their energy is concentrated into a very small area. Ongoing research continues to determine exactly how part of a thunderstorm's energy becomes concentrated into a tornado.

Where and when do tornadoes occur?
Tornadoes are possible anywhere in the United States, but are most common in the central plains east of the Rocky Mountains and west of the Appalachians. They usually occur in the late afternoon and evening during the spring and summer, being most common in the south in early spring and in the northern tier of states in the summer. However, tornadoes can occur on any day of the year and at any hour. They also can form in many other parts of the world, including Australia, Europe, Africa, Asia, and South America.

How do they form and can they be predicted?
The idea that tornadoes may form as a result of warm moist air colliding with cold Canadian air and dry air from the Rockies is a gross oversimplification. Many thunderstorms form under those conditions, which never come close to producing tornadoes. Even when the large-scale environment is quite

(Continued on page 6)

What's Inside?

Send Us Your Severe Weather Reports

We need your help. If you observe severe weather, please let us know. Call us or fill out our on-line severe weather form at *www.crh.noaa.gov/lmk/storm_report.htm*. Thank you!!

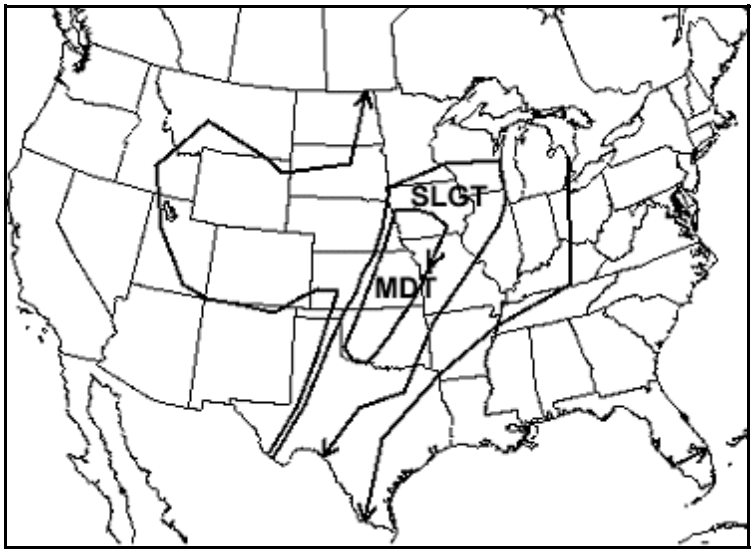
The Storm Prediction Center: Our Partner in the Protection of Life and Property

By Don Kirkpatrick, Severe Weather Meteorologist

Located in Norman, Oklahoma, the National Weather Service's Storm Prediction Center (SPC) is tasked with issuing timely, accurate forecasts and watches for severe thunderstorms and tornadoes across the lower 48 United States. SPC's products are widely used by local NWS offices, emergency managers, TV and radio meteorologists, private weather companies, storm spotters, and other groups. Meteorologists at the SPC are at the fore-front of convective storm forecasting, and team with meteorologists at local NWS offices to bring you the utmost severe storm information contained in outlooks, watches, and warnings.

Convective outlooks and watches are the most visible products issued by the SPC. The traditional 3-day outlooks consist of the terms Slight, Moderate, and High Risk, and denote potential severe storm threat areas to the general public. The degree of risk is dependent on forecasts of expected environmental conditions, severe storm coverage and intensity, and the type of severe weather predicted. A High Risk outlook is rare and usually reserved for an expected significant tornado outbreak. A High Risk forecast usually is accompanied by a public severe weather outlook issued by the SPC. Meanwhile, a Slight Risk usually denotes the potential for large hail and/or at least a few reports of wind damage.

SPC forecasts of a Slight, Moderate, or High Risk that cover all or part of south-central Indiana or central Kentucky trigger the production of a severe weather outlook from our office. This outlook narrows down the area at risk within our warning area and the time frame the risk is expected. In addition, the primary threat(s) associated with the convection, i.e., damaging winds, large hail, and/or tornadoes, is included.



The most important products issued by the SPC are tornado and severe thunderstorm watches. This involves monitoring current and forecast weather trends across the country for conditions that will lead to the development of damaging thunderstorms. SPC watches then are re-defined by local NWS offices to delineate the geographical area at risk and to alert emergency managers and storm spotters to the severe threat. Coordination between storm spotter networks and local NWS offices is essential in the warning phase of the severe storms forecast process.

In the next issue of "*Eye on the Sky,*" we will examine in more detail the severe storms forecast process, from SPC's outlooks to warnings issued by NWS Louisville.

Severe Weather Terms

Severe Weather Watch: Atmospheric conditions are favorable for severe weather in or near the watch area. Watches are issued for tornadoes and severe thunderstorms, and are for relatively large geographic areas, such as portions of states or for multiple states.

Severe Weather Warning: The severe weather event is imminent or occurring in the warned area. Warnings are issued for tornadoes, severe thunderstorms, flash floods, and river flooding and are for relatively small geographic areas, such as single or small groups of adjacent counties.

Severe Thunderstorm: A storm that produces hail 3/4 inch in diameter or larger, wind damage, wind gusts of 58 mph or more, or a tornado. Heavy rain and lightning are not severe storm criteria, but can be dangerous. Heavy rain in a short time period that causes significant flooding will prompt the issuance of a flash flood warning.

Interested in Being a Storm Spotter? Attend One of Our Classes This Spring

By Norm Reitmeyer, Warning Coordination Meteorologist

During late winter and spring, NWS Louisville conducts numerous storm spotter training and preparedness classes. We invite you to attend a class near you. Below is a list of the dates and locations of classes currently scheduled through mid April 2002. However, new classes continue to be scheduled. For more specific information, updates, or to set up a training class for your area, contact Norm Reitmeyer at 502-969-8842 or check our Web site at *www.crh.noaa.gov/lmk/spotter_reference/spotter.htm*.

Tue, March 5	Salem; Washington County, IN	Mon, March 18	Versailles; Woodford County, KY
Wed, March 6	Jasper, Dubois County, IN	Mon, March 18	Elizabethtown; Hardin County, KY
Thu, March 7	Frankfort; Franklin County, KY	Tue, March 19	Corydon; Harrison County, IN
Thu, March 7	Jamestown; Russell County, KY	Tue, March 19	Columbia; Adair County, KY
Mon, March 11	Beaver Dam; Ohio County, KY	Thu, March 21	Liberty; Casey County, KY
Tue, March 12	Georgetown; Scott County, KY	Mon, March 25	Elizabethtown; Hardin County, KY
Tue, March 12	Campbellsville; Taylor County, KY	Tue, March 26	Lawrenceburg; Anderson County, KY
Wed, March 13	Winchester; Clark County, KY	Thu, March 28	Albany; Clinton County, KY
Thu, March 14	Scottsville; Scott County, IN	Thu, April 11	Pleasureville; Henry County, KY
Thu, March 14	Louisville; Jefferson County, KY	Thu, April 18	Louisville, Jefferson County, KY

March is Severe Storms Awareness Month

By Norm Reitmeyer, Warning Coordination Meteorologist

March is here, and so is Severe Storms Awareness Month. The campaign theme this year is, "Be a Storm Survivor." The campaign is geared to help Kentucky residents and others prepare for the dangers posed by severe thunderstorms, lightning, and tornadoes, including understanding safety procedures.

During the month, our office will issue Public Information Statements on various topics related to severe weather. They will play during certain hours on NOAA Weather Radio. Then on Tuesday, March 26th, a statewide test tornado drill will be conducted, which will give all persons a chance to review what they would do in the event of a real tornado.

Kentucky Division of Emergency Management county coordinators are being urged to provide input on the effectiveness of the coming campaign. To do so, coordinators should fill out the campaign's short (one page) evaluation form available on the Kentucky Division of Emergency Management's Web site at *kyem.dma.state.ky.us*.

In 2001, seven tornadoes were verified across Kentucky. Four deaths occurred, two from severe thunderstorms and two from floods.

Warning Criteria for Red Flag Days has Changed

By Joe Ammerman, Fire Weather Meteorologist

The criteria used by the National Weather Service to warn land management agencies that critical fire weather exists has changed. The new criteria requires that afternoon relative humidity (RH) values drop to 25 percent or below AND wind speeds 20 feet above the ground average 15 mph or more. This is in conjunction with 10-hour fuel stick moisture of 8 percent or less. When these conditions are expected to be met or are occurring, the NWS will issue a Red Flag Warning. A Fire Weather Watch will be issued if the conditions are expected to occur the next day. Watches or warnings are intended to be a heads up to all firefighters that extreme fire behavior is likely. They will be headlined on NWS Louisville's Fire Weather Forecast that is issued each morning, and displayed on our Web site (*www.crh.noaa.gov/lmk*) under the fire weather section.

The old criteria required only one of the above conditions be met, i.e., either afternoon RH values of 25 percent or less OR wind speeds of 15 mph or greater combined with the 10-hour fuel requirement. The new criteria means that not as many Red Flag Warnings will be issued, but when they are, fire fighters need to be extremely careful.

Interested in a Career in Meteorology?

By Ted Funk, Science and Operations Officer

Are you or someone you know interested in meteorology as a career? The field of meteorology offers many opportunities, and requires a strong background in math, science, and computers. In high school, students can prepare by doing well in these subjects. In college, students will take courses in calculus, differential equations, physics, thermodynamics, chemistry, computer science, and earth science. They also will take numerous meteorology courses covering subjects from basic weather to advanced dynamic meteorology, mesometeorology, and forecasting. The ability to communicate well orally and in writing are very important skills as well.

Four-year meteorology students graduate with a Bachelor of Science degree. Students also can attain post-graduate degrees, if desired, including a Master of Science or a PhD degree. A number of colleges and universities across the United States offer four-year programs in meteorology and atmospheric science. Nearby schools that offer such a curriculum include Purdue University, Saint Louis University, and Ohio State University. A national list of schools is available on the Web at *www.nssl.noaa.gov/edu/schools.html*. Some schools also offer basic classes that non-meteorology majors or the general public can take if they want to learn more about the science.

There are many subject areas within meteorology, including synoptic/dynamic meteorology, mesoscale meteorology, micrometeorology, climatology, cloud physics, cloud electrification, radar, satellite, hydrometeorology, aviation, numerical weather prediction (modeling), and others. In addition, areas of expertise include winter storms, severe storms, tornadoes, flooding, hurricanes, droughts, and others.

Upon graduation, four main career opportunities are available to meteorologists, including research, operations (forecasting), teaching, and broadcasting (TV meteorologists). Within these opportunities, jobs exist within the federal government, military, private weather companies, TV stations, aviation community (airlines), utilities, and colleges and universities.

Career opportunities available to meteorologists include research, operations (forecasting), teaching, and broadcasting (TV and radio).

Government jobs are found within the National Oceanic and Atmospheric Administration (NOAA; *www.noaa.gov*), including operational forecasting and administrative positions in the National Weather Service (NWS; *www.nws.noaa.gov*) and the National Environmental Satellite, Data, and Information Service (NESDIS; *www.nesdis.noaa.gov*). Research positions exist within several NOAA labs, such as the National Severe Storms Laboratory, Forecast Systems Laboratory, and others (see *www.oar.noaa.gov* for a complete list).

The NWS is composed of national and regional headquarters offices, national forecast centers, and 122 local field offices for meteorological and hydrological services. Local offices (such as NWS Louisville) are located across the country including Alaska and Hawaii. Each office has forecast and warning responsibility for a specified area and set of counties. Computer model and subjective forecast guidance products are produced by the National Centers for Environmental Prediction (NCEP; *www.ncep.noaa.gov*).

There also are numerous private companies which hire meteorologists and provide a variety of services to their customers (a list of companies is available at *www.nws.noaa.gov/im/more.htm*). A number of airlines also hire meteorologists to provide aviation weather support to pilots. TV stations hire meteorologists for on-air and off-air weather support and forecasting. Finally, colleges and universities hire meteorologists with PhD degrees for teaching and research positions.

New Web Page Design

By Van DeWald, Webmaster

Recently, we began updating our Web site (*www.crh.noaa.gov/lmk*) to conform to a national standard which will be applied to all NWS pages nationwide. Navigating from one NWS office to another will be much easier with each site having a common look and corporate feel. Thus, if retrieving a forecast from Louisville, Kentucky, or from Denver, Colorado, the NWS office Web pages will look the same.

Building on this concept, we have developed a new forecast page to be implemented around May 1. A user simply enters a city and state, or zip code to retrieve the forecast for any location in the United States. Our new Web design presents the forecast graphically along with text, and allows a large amount of weather data to be presented on a single page. The forecast page also will contain surface observations, radar and satellite imagery, and links to all weather watches, warnings, advisories, and statements currently in effect for that area. To view an example of the new forecast page, link to *www.srh.noaa.gov/data/forecasts/KYZ030.php?warncounty=KYC111&city=Louisville.*

The Science Corner

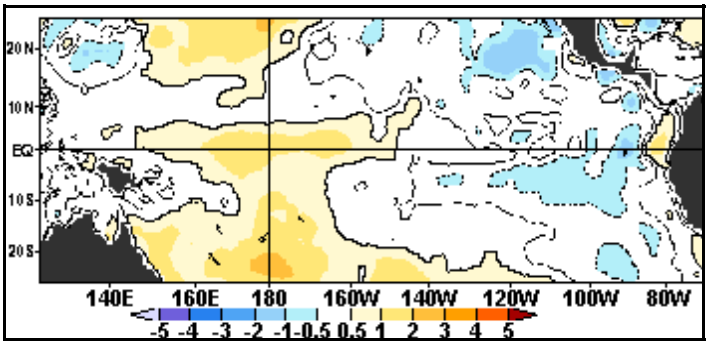
By Ted Funk, Science and Operations Officer

Understanding El Niño and Its Expected Return

Current Forecast

El Niño appears set to return. Based on observed oceanic and atmospheric circulation patterns and their recent evolution, and the time of year, warm episode conditions are beginning to re-emerge in the tropical Pacific Ocean. Recently, the Climate Prediction Center in Washington, DC indicated that the evolution towards a warm episode in the tropical Pacific continued during January 2002, as late January equatorial sea surface temperature (SST) anomalies (how much monthly temperatures vary from normal values) exceeded +1 degrees C from 170 E to 160 W longitude (near the International Date Line; see image below). SST anomalies are forecast to increase slowly throughout 2002, although the strength of the expected El Niño should be weaker than the strong episode in 1997-1998.

El Niño's main effect on weather in the United States should not be felt until later this year. Above normal temperatures are predicted this summer across the southern states. Then next winter (2002-2003), a tendency for above normal temperatures are expected across the northern tier of states with above normal rainfall across the southern U.S., i.e., weather patterns normally associated with El Niño conditions.



7-day average SST anomalies over tropical Pacific Ocean centered on February 13 (black areas are land masses).

What is El Niño?

El Niño is a disruption of the ocean-atmosphere system in the tropical Pacific that can have important consequences for weather around the world. These effects include increased rainfall and possible flooding across the southern United States and in Peru, and drought in the western Pacific and possible significant brush fires in Australia.

Weather conditions and SST trends in the tropical Pacific are considered essential for the prediction of short term (a few months to 1 year) climate variations. Thus, NOAA maintains a network of buoys which provide temperature, ocean current, and wind data from the equatorial Pacific region for researchers and forecasters.

In normal (non-El Niño) conditions, trade winds generally blow from east to west across the tropical Pacific. These winds pile up warm surface water in the western Pacific resulting in a higher ocean surface level (about 1/2 meter) and temperature (up to 8 degrees C) near Indonesia than by equatorial South America. The cooler water off of South America results from upwelling of cold water from deeper levels. This water is nutrient-rich, thereby supporting a diverse array of marine ecosystems and fisheries. Rainfall is most prominent in the western Pacific due to rising air over the warmest water, with relatively dry conditions over the cool water in the eastern equatorial Pacific.

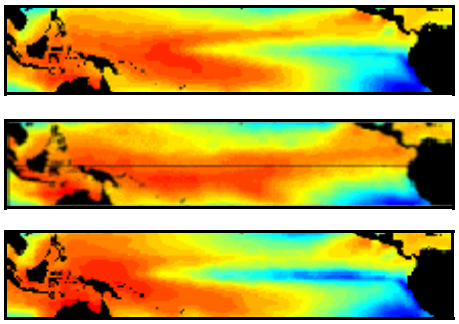
During El Niño, the trade winds relax in the central and western Pacific. This can lead to the development of warmer water in the central and eastern tropical Pacific which suppresses upwelling of cool sub-surface ocean water. In turn, the marine system can be adversely affected due to less near-surface nutrient-rich water. Commercial fisheries also are affected as fish tend to remain in cooler water farther below the sea surface. Rainfall follows the warm water eastward, with associated flooding possible in Peru, and drought in Indonesia and Australia. The eastward displacement of the atmospheric heat source overlaying the warmest water can result in large changes in the global atmospheric circulation. As a result, seasonal weather patterns can be affected in regions far removed from the tropical Pacific.

Past El Niño episodes occurred in 1986-1987, 1991-1992, 1993, 1994, and 1997-1998, which was a particularly strong episode. It is unusual for El Niños to occur in rapid succession, as occurred from 1991-1994.

What is La Niña?

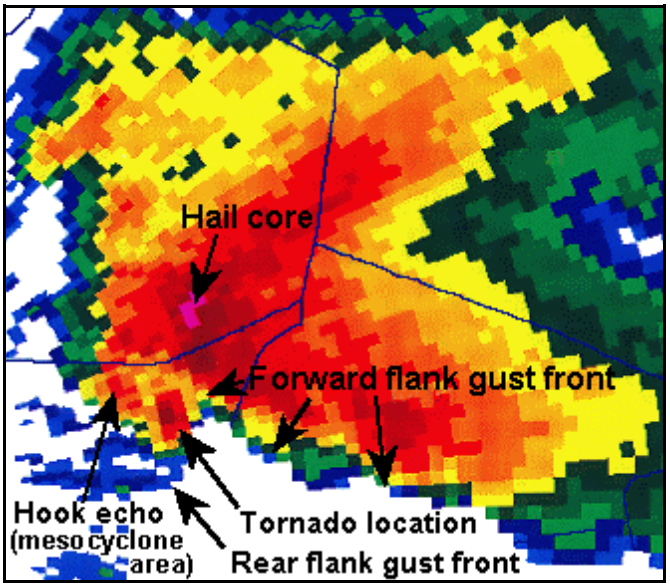
La Niña, generally considered the opposite of El Niño, is characterized by unusually cold ocean temperatures in the equatorial eastern Pacific. La Niña events sometimes (but not always) follow El Niño episodes. Recent La Niña conditions occurred in 1988-1989 (strong episode), 1995-1996 (weak), and 1998-1999 (strong).

More information can be found on NOAA's El Niño and La Niña Web sites at *www.elnino.noaa.gov* and *www.elnino.noaa.gov/lanina.html*, respectively.



Images of tropical Pacific showing SST anomalies. Red (blue) is relatively warm (cool) water. Top: a normal episode. Middle: El Niño episode with warmer water in the eastern Pacific. Bottom: La Niña condition with colder than normal SSTs in the eastern Pacific.

favorable for tornadoes, not every storm spawns one. Instead, tornadoes form via complicated storm-scale processes which depend on the interaction of the storm's internal dynamical structure including its forward and rear flank gust fronts (see below) with the influx of buoyant, sheared air immediately around and under the rotating updraft (mesocyclone) within the storm. In fact, recent theories suggest that the temperature and moisture characteristics of the rear flank downdraft of a supercell are very important in spawning a tornado. Although prediction of the exact location and intensity of tornadoes is difficult, atmospheric conditions associated with the formation of the parent severe storms often are well-forecast.



A tornadic supercell thunderstorm in central Kentucky In May 1996 as shown by NWS Doppler radar. Important radar signatures are annotated.

How are tornadoes detected?
Once thunderstorms develop, the National Weather Service's WSR-88D Doppler radar is used to evaluate severe weather and tornadic radar signatures in order to make short-term predictions of tornado occurrence. If a tornado is suspected, a tornado warning is issued for the affected area. However, while Doppler radar can interrogate severe storms very well, it cannot always detect the small-scale processes that actually lead to tornadogenesis. Therefore, trained storm spotters, public officials, and the media also are vital in the warning process by gathering, relaying, and disseminating pertinent observed weather information. This partnership facilitates the proper detection and warning of tornadoes for the general public.

What type of damage can they do?
Damage results from the strong winds within a tornado. The degree of damage and speed of these winds vary widely, depending on the intensity of the tornado. The Fujita Scale is designed to assess damage produced by tornadoes, then estimate associated wind speeds by assigning an "F" rating. The scale ranges from F0 (weak tornado with winds up to 72 mph) to F5 (very violent tornado with winds around 300 mph). The majority of tornadoes range from F0-F3. All tornadoes produce damage, but the most violent ones can cause automobiles to become airborne, rip homes to shreds, and turn broken glass and other debris into lethal missiles. The biggest tornado threat to human beings is from flying debris in the wind. It is important to note that straight-line winds from a thunderstorm can do damage similar to an F0 or F1 tornado.

What is the smallest, largest, and average size?
Tornadoes can vary significantly in size and intensity. Thus, the easiest way to answer this question is to assess the size of the damage path. However, the term "average" can be misleading, since the majority of tornadoes are small compared to the infrequent large events. With this said, the typical tornado damage path is about one or two miles, with a width of around 50 yards. The largest tornado path widths can exceed one mile, while the smallest widths can be less than 10 yards. Widths can even vary considerably during a single tornado, since its size can change during its lifetime. Path lengths can range from a few yards to more than 100 miles. A key point to remember is that the size of a tornado is not necessarily an indication of its intensity. Large tornadoes can be relatively weak, while small tornadoes occasionally can be violent.

How long and fast is a tornado on the ground?
Detailed statistics are not available to answer this question. Nevertheless, ground time can range from an instant to several hours, although the typical time is around 5 to perhaps 10 minutes. Supercell tornadoes tend to be longer-lived, while those pawned by squall lines and bow echoes may only last for a few minutes. Tornado movement can range from virtually stationary to more than 60 miles per hour.

What is a multiple-vortex tornado?
A multiple-vortex tornado contains two or more small, intense sub-vortices rotating around the center of the larger tornadic circulation. Occasionally visible, these vortices may form and die within a few seconds, and can occur in all tornado sizes, from huge "wedge" tornadoes to narrow "rope" tornadoes. Sub-vortices can cause narrow, short, extreme swaths of damage that sometimes arc through tornado tracks.

More information about tornadoes can be found on-line at *www.spc.noaa.gov/faq/tornado* and at *www.nssl.noaa.gov/researchitems/tornadoes.shtml.*

Protecting Yourself From a Tornado

One of the best ways to protect yourself from a tornado is to have a pre-set plan in place before a tornado is observed or a warning is issued. In other words, know what to do and where to go in case a tornado threatens your area. Remember, seconds can save lives. Tornado safety rules are reviewed below.

You must protect yourself from flying and falling debris. In homes, a basement offers the best protection. Get under something sturdy such as a strong workbench or a staircase. If you have no basement, go to an interior small room on the lowest floor and in the center of your home. Bathrooms and closets are good choices. The idea is to put as many walls between you and an approaching tornado as possible; flying debris can penetrate exterior walls. Stay away from windows!

Mobile homes are particularly vulnerable to overturning during strong winds and should be evacuated when strong winds or tornadoes are expected. Damage can be minimized by securing trailers with cables anchored in concrete footing. Trailer parks may have community storm shelters. If there is no shelter nearby, leave the trailer park and take cover on low-protected ground or in a neighboring frame home if available.

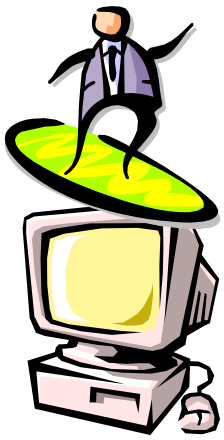
If you are in a motor vehicle in a populated area, do not try to outrun a tornado. Abandon your vehicle and seek shelter nearby. If none is available, then get in the nearest ditch or depression until the tornado passes.

If you are traveling in a rural area, drive away from the tornado at a right angle to its path. If caught in the open, get down in a sheltered low spot and cover your head with your arms.

In schools, hospitals, and shopping centers, move to pre-designated shelter areas. Interior hallways on the lowest floors are best. Stay out of auditoriums, gymnasiums, and other structures with wide free-span roofs.

Like to Surf? Check Out These Interesting Scientific Web Sites

National Oceanic and Atmospheric Administration	www.noaa.gov
National Weather Service Headquarters.	www.nws.noaa.gov
National Centers for Environmental Prediction	www.ncep.noaa.gov
Hydrometeorological Prediction Center	www.hpc.ncep.noaa.gov
Storm Prediction Center	www.spc.noaa.gov
Center for the Analysis and Prediction of Storms	www.caps.ou.edu
Aviation Weather Center	www.awc-kc.noaa.gov
National Hurricane Center	www.nhc.noaa.gov
National Severe Storms Laboratory.	www.nssl.noaa.gov
National Center for Atmospheric Research	www.ncar.ucar.edu
National Climatic Data Center	www.ncdc.noaa.gov
National Earthquake Information Center	wwwneic.cr.usgs.gov
National Aeronautics and Space Administration	www.nasa.gov
Climate Prediction Center	www.cpc.noaa.gov
Marine Prediction Center.	www.mpc.ncep.noaa.gov
Space Environment Center	www.sec.noaa.gov
NOAA Research	www.oar.noaa.gov
NOAA Central Library	www.lib.noaa.gov
NOAA Photo Library	www.photolib.noaa.gov
WSR-88D Warning Decision Training Branch.	www.wdtb.noaa.gov
Meteorology Education and Training Home Page	meted.ucar.edu
Interactive Weather Information Network	iwin.nws.noaa.gov/iwin/graphicsversion/main.html
Online Guide to Meteorology	ww2010.atmos.uiuc.edu/(Gh)/guides/mtr/home.rxml
Lightning and Atmospheric Electricity Information	thunder.msfc.nasa.gov
Severe Thunderstorm Climatology	www.nssl.noaa.gov/hazard
The Weather Room.	www.nssl.noaa.gov/edu



A Change in Hydrologic and Flood Products

By Mike Callahan, Service Hydrologist

The National Weather Service has changed some of the watches, warnings, and statements issued for flooding to better inform you of the various threats. Below is a short summary of the new products and when they will be used.

Hydrologic Outlook: Issued when there is a possibility of widespread flooding beyond 36 hours. This product also is used occasionally during the spring to discuss the current versus normal hydrologic state at that time of year.

Flood Watch: Issued whenever there is a good chance of flooding over an area within the next 36 hours, but the flooding is neither certain nor imminent. This product used to be called Flash Flood Watch.

Flash Flood Warning: Issued when flooding that threatens lives and property is occurring or imminent within six hours of the causative event. During prolonged flooding after heavy rain ends, a Flash Flood Warning may become a Flood Warning.

Flash Flood Statement: Contains updated information on current Flash Flood Warnings, including cancellations. Additional information on Flood Watches will be released as Flood Statements, not Flash Flood Statements as in the past.

Flood Warning: Issued when flooding is expected to occur or continue more than six hours after the causative event.

Flood Statement: Used to update information on Flood Watches and Flood Warnings. It also informs about elevated stream flows or urban ponding of water which warrants public notification but not a warning. The latter situation used to be covered by an Urban and Small Stream Flood Advisory.

New WXCODER System for Cooperative Observers

By Larry Dattilo, Data Acquisition Program Manager

For years, cooperative observers have taken daily temperature and precipitation observations, and have sent this information to local NWS offices via telephone or by a special data storage and transmission device. This device first was implemented in 1983 and worked with a rotary telephone. It later was upgraded in 1989 when touch tone telephones became commonplace.

In 2001, a new system of recording and transmitting observations was created. The WXCODER system, which stands for Web Xmitted Cooperative Observer Data Encoded Report, uses the Internet and the observer's home personal computer (PC). All the observer needs is Internet access, a username, and a password which are furnished by the local NWS office.

All weather data recorded by a cooperative observer is easily entered, with built-in quality checks to eliminate most formatting errors. Because the program is Web-based, program changes can be performed from one central location, thus eliminating any data transmission delays due to equipment malfunction. In addition, WXCODER will no longer require special collection computers or individual software programs. Even if an observer does not own a PC, but has Internet access with Web-TV, WXCODER will work.

If you have any questions concerning this new program or other questions about the cooperative program for your area, please call NWS Louisville for more information.

National Weather Service Louisville, Kentucky

We serve 59 counties in central Kentucky and south-central Indiana, including forecasts, warnings, statements, aviation services, and hydrologic products.

Climatological Calendar

Climatological Data: Winter 2001/2002							
Location	**Month**	**Average Temperature**	**Departure From Normal**	**Total Precipitation**	**Departure From Normal**	**Highest Temp (Date)**	**Lowest Temp (Date)**
Louisville	Dec	41.1	+4.3	4.53	+0.84	73 (5th)	11 (30th/31st)
	Jan	39.0	+6.0	5.18	+1.90	68 (28th)	11 (1st)
	Feb	38.8	+1.2	1.45	-1.80	67 (25th)	14 (28th)
Lexington	Dec	40.9	+4.6	2.89	-1.14	72 (5th)	9 (30th/31st)
	Jan	37.8	+5.8	2.39	-0.95	71 (31st)	8 (1st)
	Feb	37.7	+1.3	1.37	-1.90	66 (1st/25th)	12 (28th)
Bowling Green	Dec	42.2	+3.9	5.08	+0.02	72 (5th)	12 (30th)
	Jan	39.5	+5.3	4.04	-0.11	72 (29th/31st)	10 (1st)
	Feb	38.7	+0.1	0.90	-3.25	65 (20th/25th)	13 (28th)

Normal High/Low Temperatures				
Location	**Mar 1**	**Apr 1**	**May 1**	**Jun 1**
Louisville	51/32	63/42	71/51	80/61
Lexington	50/31	61/40	71/48	80/59
Bowling Green	53/32	64/41	74/50	82/60

Outlook for Spring 2002

The 90-day outlook for March, April, and May 2002 calls for near normal precipitation and temperatures across the Ohio Valley. Despite forecasted near normal climatological conditions, daily weather can vary widely, with periods of unseasonably warm and cool temperatures, and episodes of heavy precipitation including thunderstorms.

NEW **Monthly Normal High and Low Temperatures and Precipitation (Liquid Equivalent): 1971-2000**

Lexington	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**	**YEAR**
Average High	39.9	45.2	55.3	65.1	74.0	82.3	85.9	84.6	78.1	66.9	54.5	44.3	64.7
Average Low	24.1	27.7	35.9	44.1	53.6	62.2	66.4	64.9	57.9	46.4	37.3	28.4	45.7
Precipitation	3.34	3.27	4.41	3.67	4.78	4.58	4.80	3.77	3.11	2.70	3.44	4.03	45.90
Louisville	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**	**YEAR**
Average High	41.0	46.6	56.8	66.8	75.4	83.3	87.0	85.8	79.4	68.4	55.9	45.4	66.0
Average Low	24.9	28.5	37.1	46.0	56.1	65.1	69.8	68.2	60.9	48.5	39.3	29.9	47.8
Precipitation	3.28	3.25	4.41	3.91	4.88	3.76	4.30	3.41	3.05	2.79	3.80	3.69	44.53
Bowling Green	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**	**YEAR**
Average High	43.0	48.6	58.6	68.6	77.0	85.3	89.2	87.8	81.1	70.1	57.6	47.4	67.8
Average Low	25.4	28.6	36.9	45.0	54.5	64.4	67.7	65.7	58.1	45.7	37.2	29.2	46.5
Precipitation	4.15	4.15	4.97	3.99	5.36	4.29	4.54	3.36	4.13	3.17	4.46	5.06	51.63

Craig and Donna are Coming to NOAA Weather Radio

By Ted Funk, Science and Operations Officer

Paul, commonly referred to as Igor, soon will be out. Craig and Donna will be taking over in the near future. Who are these people? Well, they are not people at all. They are computer-generated voices for the NOAA Weather Radio (NWR). Igor is the voice you hear today, and while he has served us well during his tenure, his time is limited.

The National Weather Service has selected new, improved voices for NWR. These voices are more understandable and human-sounding than the current voice (Igor), and will help the NWS deliver warnings, watches, forecasts, and other hazard information quickly and accurately.

After months of evaluating voice technologies and receiving public input last year, the National Oceanic and Atmospheric Administration (NOAA) awarded a contract to a private company with voice improvement software. This software combines phonetic sounds with natural language modeling. It also combines concatenated, pre-recorded phonetic sounds with the emphasis and intonation of a human voice.

Several new voices were tested and made available for public opinion. Of the tested male voices, "Craig" was rated first or second in 95 percent of the public comments. Meanwhile, "Donna" rated highest for tested female voices.

Deployment of the new software to NWS offices will begin in early spring. The voices will then need to be "taught" to properly pronounce local county and town names. After this occurs, Craig and Donna will be ready for their new assignment, and we will bid a fond farewell to Igor. NWS Louisville expects this to occur sometime late this spring. We are not sure who will get the most air time yet, but either way, you will notice the difference.

Astronomical Calendar

Sunrise/Sunset

	Louisville		Lexington		Bowling Green		
Date	**Sunrise**	**Sunset**	**Sunrise**	**Sunset**	**Sunrise**	**Sunset**	Times are given in est (Eastern Standard Time), edt (Eastern Daylight Time), cst (Central Standard Time), and cdt (Central Daylight Time), as appropriate.
Mar 1	7:15 am est	6:36 pm est	7:10 am est	6:31 pm est	6:17 am cst	5:40 pm cst	
Apr 1	6:28 am est	7:06 pm est	6:23 am est	7:01 pm est	5:32 am cst	6:08 pm cst	
May 1	6:47 am edt	8:34 pm edt	6:42 am edt	8:29 pm edt	5:52 am cdt	7:35 pm cdt	
Jun 1	6:21 am edt	9:00 pm edt	6:17 am edt	8:55 pm edt	5:28 am cdt	8:00 pm cdt	

Moon Phases

New Moon	First Quarter	Full Moon	Last Quarter
Mar 14	Mar 22	Mar 28	Mar 6
Apr 12	Apr 20	Apr 27	Apr 4
May 12	May 19	May 26	May 4
Jun 10	Jun 18	Jun 24	Jun 3

Vernal Equinox (Start of Spring):
March 20 at 2:16 pm est (1:16 pm cst)

Start of Daylight Savings Time:
Sunday, April 7 at 2:00 am local time
(turn clocks ahead one hour)